

Environmental Action Programme Support
Contract DHR-C-00-95-00034-00
United States Agency for International Development

MUNCIPALITY OF STARA ZAGORA GAS CONVERSION PROJECT
COST/BENEFIT ANALYSIS

Submitted to:
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and
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Prepared for:
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and
The Municipality of Stara Zagora, Bulgaria

August 1997

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MUNICIPALITY OF STARA ZAGORA GAS CONVERSION PROJECT COST/BENEFIT ANALYSIS

A. The Analysis

A1. Background

Chemonics International is assisting the municipality of Stara Zagora in a gas conversion project through the Environmental Action Program Support (EAPS) project. This assistance has included measuring the project's costs and benefits.

Approximately 31 municipal sites are candidates for conversion from light diesel (naphtha) oil and mazut to natural gas. The project has retained a local engineering firm to assess each site and prepare a site-specific cost study, which will describe the maximum reimbursed amount for the conversion of approved sites.

As part of this effort, project personnel have calculated the potential economic savings and the investment return period. Even though all planned municipal conversions involve oil, electric power was included as a comparison base for potential electrical conversions. The methodology and assumptions used to develop the financial tables were the following:

Cost. A value added tax (VAT) of 22 percent will be included on all materials purchased for conversions. This tax, which will not be reimbursed through the USAID project, is included to more accurately measure savings and the required payback period. Although the cost estimate includes the necessary meters, meter ownership and responsibility are not defined by Bulgarian law. Customer ownership would create a worst-case scenario.

Fuel prices. Fuel prices are set by the state. The latest ministerial decree of June 10, 1997 on fuel prices was used in this analysis for the gas price. The light diesel oil price is from the decree of April 1, 1997.

Comparison basis. The cost of heating one billion calorie units (one giga calorie) was used.

Burner efficiency. A burner efficiency of 80 percent for oil and 83 percent for gas was assumed. A boiler's actual efficiency can be determined only under operating conditions.

Fuel usage. POVVIK-EP Ltd., an engineering consulting firm, based this data on burner usage needed to heat open buildings at each site. Historic data is unreliable, as buildings have often been closed or underheated in the past due to a lack of money for fuel.

Cost savings. In calculating savings and payback, recommended fuel usage was decreased 35 percent to reflect municipal savings opportunities. This adjustment compensated for the lack of reliable fuel data.

A2. Financial Analysis

A comparison of cost per giga calorie, found in Appendix 1, was developed from the above assumptions. In this comparison the effective caloric value for each type of fuel was computed, which was then converted to a value expressed in giga calorie units (one billion). Heating units were then costed and converted to U.S. dollars at an exchange rate of 1,675 leva to the dollar. (The value of the leva, which was tied to the German mark on July 1, 1997, is 1,000 leva per mark or approximately 1,700 leva per U.S. dollar. The use of a currency in the analysis minimizes the effect of currency fluctuations on data). The fuel cost of producing one giga calorie of heat was then compared to the cost for natural gas. The next step was to compute the savings realized from converting to an alternative fuel, natural gas. Finally, the savings of natural gas over light diesel—61.98 percent—was used to estimate the savings and potential payback for each proposed site in the Stara Zagora conversion project, as contained in Appendix 1.1, Analysis of Savings and Payback at Suggested Sites. As noted above, the savings calculation was based on a projected fuel usage of 65 percent, with fuel priced at \$433.25 per ton.

The analysis clearly demonstrates that the activity is economically sound. The completion of Stara Zagora's 31 conversions will have a significant positive effect on the city's \$1,350,000 budget and Stara Zagora's ability to provide effective services to its population. Phase 1 reimbursement program sites, approved by USAID, will provide \$100,363 in annual savings and a combined project payback of 1.7 years. Of the 28 sites with available cost analyses, the savings potential is \$645,636 annually, with a conversion cost payback of 1.2 years.

Although it is impossible to assess the precise effect of this conversion on municipal finances for any given year, the above analysis indicates that the overall effect would be positive. However, the municipality's commitment to financing conversions beyond the current USAID grant is unknown. For the remainder of USAID's grant, gross savings will be affected by the choice of sites. Gas price fluctuations from one year to another could also alter results. While it is clear that all 31 sites cannot be completed within current USAID reimbursement funding, the program's positive effects should attract short-term loans from other sources. The seven sites marked with an asterisk in Appendix 1.1 are first-phase sites requested by the municipality and approved by USAID for conversion. These sites have a maximum conversion reimbursement of approximately \$147,000, representing almost 37 percent of the \$400,000 available in the grant reimbursement fund. The savings and payback potential of these sites, as shown in the referenced table, can provide the municipality with a guide for selecting the next phase of sites for USAID reimbursement. Except for the value added tax, the municipality can use the savings on sites reimbursed by USAID for a revolving municipal fund to finance further conversions.

As this analysis was based on current prices and assumptions, a sensitivity impact study was performed to determine the effect that increased natural gas prices would have on the savings realized from substituting natural gas for light diesel oil. The study indicated that natural gas prices would have to increase 32 percent to reduce projected savings potential from 62 percent to 50 percent. Put another way, a 12 percent decrease in savings would occur for every 32 percent increase in gas prices. This result should increase confidence in the conversion project and the municipality's support for a natural gas network in Stara Zagora.

A3. Conclusion

The gasification project and USAID's gas conversion reimbursement will produce a positive net effect on the municipality's finances. This positive result is in addition to the potential for improved

municipal service in converted buildings, a cleaner environment, and regional economic growth. A professional engineering consulting firm provided engineering data that has been used to produce a potential effect rather than a possible return. Investing in a revolving fund to finance further gas conversions could help lighten the municipality's financial burden in completing the gasification project.

B. Investment in the Gas Joint Venture

B1. The Investment

Stara Zagora's investment in the joint venture was brought up in a meeting with the deputy mayor, Ivailo Kalaidjiev, on June 9, 1997. At that time, Mr. Kalaidjiev said that a balance sheet would be produced for the joint venture's fiscal year ending May 31, 1997. Dayan Kavrov, a legal advisor on LGI's staff, provided a balance sheet and profit and loss statement as of December 31, 1996, on June 26, 1997. This document was translated on July 7, 1997.

The December 31, 1996 balance sheet in Appendix 2 indicates that the joint venture has a negative net worth of 3,919,000 leva, or approximately \$2,340. Of that sum, Stara Zagora is responsible for 48 percent, or \$1,123. While these sums do not appear to be of concern, there has been considerable construction activity since the beginning of the year. The following questions must be posed: first, what compensation is Stara Zagora receiving for rights of way and building permits, and second, is the city liable for a share of the pipeline's new costs? In the previously mentioned meetings, the deputy mayor indicated that the value of the city's rights of way and permits would balance any liability the city might have. The municipality has set up a special committee to negotiate the joint venture divestiture; however, an attempt to obtain insight into the committee's strategy failed.

Dayan Kavrov believes that the question of the municipality's financial position in this situation may be moot since all improvements to municipal property benefit the municipality. As a result, the municipality will neither lose or gain in the existing joint venture.

B2. Conclusions

Neither LGI, in its work on concessions and the regulatory commission, nor the deputy mayor has considered the above situation a problem. However, the potential exists for a loss to the municipality until the above questions on compensation for rights of way and liability are fully answered and a current balance sheet is made available in English.

B3. Next Steps

- Obtain a current balance sheet for the joint venture, analyzing for hidden receivables or liabilities and determining pipeline value.
- Obtain legal opinion on the ownership of municipal property improvements and distribution systems such as pipelines built on municipal property.
- Settle the joint venture valuation question separately from the concession agreement, not allowing it to become a bargaining chip in future negotiations.

C. Financial Considerations in City's Preparation for Regulatory Commission Role

C1. Background

The following are descriptions of potential actions and responsibilities for the Concession Regulatory Committee's submission of rules and bylaws to the Municipal Council.

Producing Annual Reports:

Operations

- Number of services by service class
- Volume sold by service class
- Kilometer of pipe added and updated system map
- Reduction stations added to system
- Volume delivered by service class monthly

Financial

- Revenue by service
- Bad debt by service class
- Expenditures on stations and pipe added to system
- Audited balance sheet and profit and loss statement

Planning

- System expansion plan for next 12 months
- Timetable for system expansion plan with maps
- Service objectives and customer awareness program plan

Maintaining Database:

- Database of information on each concession for municipality and other interested parties

Recommended Pricing:

- Review of gas prices if price setting is delegated to the municipal level

Proposing a Concession Tax or Royalty Methodology:

- Methodology for calculating a concession tax or royalty, estimating the value this tax or royalty will produce for the municipality

As currently set up, the Regulatory Commission is an advisory arm of the municipal government receiving all its authority through municipal ordinances. At the time of this assignment, the commission had little form beyond its appointed membership. As the commission is dependent on the council, its role is yet to be defined. A draft of the areas of responsibility described above were provided for a June 26, 1997 commission meeting called to consider the development of the commission's role. In the opinion of this consultant, development of the commission's role has taken place on a piece-meal basis, detracting from the potential regulatory impact of future concessions and agreements.

The Regulatory Commission's current economic role is limited, as both tariffs and gas installation standards are set at a national level. The concession royalty, however, still falls within the commission's domain.

A concession royalty is a payment by the concessionaire for use of municipal property. Normally, this payment is related to property used or volume passing through the property. The payment should not be based on concessionaire operating results or profits. It can be assessed per kilometer of system pipeline or per cubic meter of gas flowing through the system. Either requires measurement of the system or system segment that uses municipal property. To encourage system expansion, a municipality can base this rate on a minimum distribution system or initial volume flow and then increase rates in incremental steps. The municipality has received a proposal from the likely concessionaire, Overgas Ltd., which LGI has analyzed. An English version of the proposal is not available.

The municipality is developing a concession proposal including a discussion of concession royalties. A discussion of concession royalties also appears in the Overgas presentation. As the approach taken by the municipality will be in effect for the life of the agreement, this opportunity to add to municipal finances should not be overlooked in the desire to complete a contract with a supplier.

C2. Conclusions

The Regulatory Commission has yet to establish the scope of its activities. Every effort should be made to help the commission define its current responsibilities and develop its regulatory role. Bulgaria lacks information on concession finance, royalties, and databases. More work, training, and education are needed to define the commission's role and help it evolve into a model that can be replicated elsewhere.

C3. Next Steps

A better definition is needed of the assistance required by the municipality to form the Regulatory Commission. A coordinated effort that is acceptable to the sponsor and conforms to current Bulgarian law is needed to provide improved service and management for this and future concessions. To achieve success, the municipality must establish ownership of this process and become a partner in realizing the goal of providing better municipal services and management. This coordinated effort should be staffed by a mix of local and expatriate specialists dedicated to this activity, under the direction of a project manager.

D. Methodology and Tools to Evaluate Capital Investments, Concessions, and Other Opportunities

The process of evaluating a project begins with an understanding of the benefit that one expects to derive from the activity. The activity may be motivated by health, safety, environmental, service, or financial factors, which must be prioritized to evaluate a project effectively. If financial improvement is not a high priority, the project will often not involve cost savings but rather a least-cost analysis. Municipalities in the former Soviet bloc have considerable experience in least-cost analysis through past tenders on major procurement activities. As long as tender documents clearly state expected results and include nonperformance penalties, this practice is the preferred analytical method for evaluating projects with benefits that are largely other than financial.

Evaluating projects with a primarily financial expected benefit usually involves examining the potential savings that the project will achieve. This savings is usually compared to the cost of implementing the project to achieve its payback period or a nominal rate of return on the investment. The payback period is the number of years of project savings needed to return the funds invested in the project. The nominal rate of return is a comparison of the interest available on funds in savings institutions or other available investments with the payback period, expressed as an annual rate of return on project cost.

In applying these financial evaluation tools, the first step is to determine the cost of the project, including finance and interest costs for securing the necessary funds. The next step is to measure the expected financial benefits of the project. If the project provides a new service, the annual revenue earned by the service can be measured. If the project replaces a current service with a new technology, evaluators can measure the annual cost of providing the service under the old technology compared to the new technology.

In the case of using new technology to provide an existing service, the annual savings can be computed by subtracting new costs from old. The savings percentage is the result of dividing annual savings by the old cost. In the analysis of the cost savings of gas conversion in Stara Zagora, the cost savings is the difference between the cost of providing one giga calorie of heat with light diesel oil and mazut compared to the cost of using natural gas. If the project provides a new service, then the project's savings are the service's annual net revenues or in some cases its profits.

Once the project's savings are determined, its payback period and nominal rate of return can be calculated. To develop the payback period, the evaluator must divide the project cost by the annual savings. The answer represents the number of years needed to recover the project costs from the project's anticipated savings.

To determine an investment's nominal rate of return to compare it to other potential investments, the payback period in years is divided by 100 percent. The resulting percentage is the nominal rate of return on the investment under consideration. For example, a payback period of six years results in a nominal return on investment of 16.7 percent. This return of rate can be compared to other available investment opportunities that a municipality is considering.

Estimates of project savings are often based on projected data, which, like most projections, contain a margin of error. To measure the effect of this uncertainty, a sensitivity analysis should be carried out on savings and payback calculations. In this analysis, the element in the cost and savings calculation with the highest potential for change or uncertainty is identified. The value of this element is adjusted to determine the percentage of savings change for each percentage of change in costs. The higher the percentage change required to change the savings calculation by 1 percent, the more insensitive project savings are to the uncertainty. This tool allows evaluators to test a project's financial potential with a number of variables to track potential risk or changes.

In any financial analysis, a reliable outcome depends on the accuracy of the data. The analyst must confirm and document the source of the data whenever possible. Including the data source in an analytical document is a good practice and an aid to those who use the document.

	APPENDIX 1		
MUNICIPALITY OF STARA ZAGORA			
GASIFICATION PROJECT			
COMPARISON OF COST PER GIGA CALORIE VALUE			
DESCRIPTION	LIGHT DIESEL	ELECTRICITY	NATURAL GAS
UNIT OF MEASURE	KILO	KILOWATT HOUR	CUBIC METER
BOILER CONVERSION EFFICIENCY	80%	100%	83%
CALORIC VALUE	10,000	116	8,000
EFFECTIVE CALORIC VALUE	8000	116	6,640
GIGA CALORIES PER UNIT	0.008	0.000116	0.0066
GIGA CALORIES PER 10,000 UNITS	80	1.16	67
NO. OF UNITS PER 1 GIGA CALORIE	125	1160	150
COST PER UNIT (LEV)	726	121	230
COST -ONE GIGA CALORIE - LEV	90,750	140,360	34,500
DOLLAR EQUIV 1675/\$1	\$54.18	\$83.80	\$20.60
% SAVED PER GIGA CALORIE			
BY CONVERTING TO GAS	61.98%	75.42%	

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MUNICIPALITY OF STARA ZAGORA							
GASIFICATION CONVERSION PROJECT							
CUST/BENEFITS ANALYSIS - SITES IN PHASE							
COST/BENEFIT ANALYSIS - SITE NAME	Day Care Center #3						
SITE LOCATION	76 Gen. Stoletov St.						
FUEL TYPE	Light diesel oil						
ANNUAL QUANTITY USED	55 Ton						
COST OF ANNUAL FUEL	\$23,829						
CALCULATED NATURAL GAS SAVINGS %	61.98%						
ANNUAL SAVINGS	\$14,769						
COST OF CONVERSION	\$20,159						
PAYBACK - EXPRESSED IN YEARS	1.4						

COST/BENEFIT ANALYSIS - SITE NAME	Day Care Center #30				
SITE LOCATION	59 Avgusta Trayana St.				
FUEL TYPE	Light diesel oil				
ANNUAL QUANTITY USED	55 Ton				
COST OF ANNUAL FUEL	\$23,829				
CALCULATED NATURAL GAS SAVINGS %	61.98%				
ANNUAL SAVINGS	\$14,769				
COST OF CONVERSION	\$20,159				
PAYBACK - EXPRESSED IN YEARS	1.4				
COST/BENEFIT ANALYSIS - SITE NAME	Day Care Center #6				
SITE LOCATION	9 Dimitar Podvarachov				
FUEL TYPE	Light diesel oil				
ANNUAL QUANTITY USED	53 Ton				
COST OF ANNUAL FUEL	\$22,962				
CALCULATED NATURAL GAS SAVINGS %	61.98%				
ANNUAL SAVINGS	\$14,232				
COST OF CONVERSION	\$22,084				
PAYBACK - EXPRESSED IN YEARS	1.6				
COST/BENEFIT ANALYSIS - SITE NAME	Day Care Center for Orphans				
SITE LOCATION	10 Rozova Dolina St.				
FUEL TYPE	Light Diesel oil				
ANNUAL QUANTITY USED	37 Ton				
COST OF ANNUAL FUEL	\$16,030				
CALCULATED NATURAL GAS SAVINGS %	61.98%				
ANNUAL SAVINGS	\$9,936				
COST OF CONVERSION	\$22,050				

PAYBACK - EXPRESSED IN YEARS	2.2				
COST/BENEFIT ANALYSIS - SITE NAME	Day Care Center #9				
SITE LOCATION	2 Rozova Dolina St.				
FUEL TYPE	Light Diesel oil				
ANNUAL QUANTITY USED	55 Ton				
COST OF ANNUAL FUEL	\$23,829				
CALCULATED NATURAL GAS SAVINGS %	61.98%				
ANNUAL SAVINGS	\$14,769				
COST OF CONVERSION	\$22,387				
PAYBACK - EXPRESSED IN YEARS	1.5				
COST/BENEFIT ANALYSIS - SITE NAME	Day Care Center #9				
SITE LOCATION	2 Otets Paisry St.				
FUEL TYPE	Light Diesel oil				
ANNUAL QUANTITY USED	53 Ton				
COST OF ANNUAL FUEL	\$22,962				
CALCULATED NATURAL GAS SAVINGS %	61.98%				
ANNUAL SAVINGS	\$14,232				
COST OF CONVERSION	\$20,159				
PAYBACK - EXPRESSED IN YEARS	1.4				
COST/BENEFIT ANALYSIS - SITE NAME	High school # 10				
SITE LOCATION	68 Avgusta Trayana St.				
FUEL TYPE	Light Diesel oil				
ANNUAL QUANTITY USED	80 Ton				
COST OF ANNUAL FUEL	\$34,660				
CALCULATED NATURAL GAS SAVINGS %	61.98%				
ANNUAL SAVINGS	\$21,482				
COST OF CONVERSION	\$28,745				

PAYBACK - EXPRESSED IN YEARS	1.3				
SUMMARY OF PHASE ONE OF CONVERSION					
COST/BENEFIT ANALYSIS - SITE NAME	Phase #1 Total				
SITE LOCATION					
FUEL TYPE	Light Diesel oil				
ANNUAL QUANTITY USED	388 Ton				
COST OF ANNUAL FUEL	\$168,101				
CALCULATED NATURAL GAS SAVINGS %	61.98%				
ANNUAL SAVINGS	\$104,189				
COST OF CONVERSION	\$155,743				
PAYBACK - EXPRESSED IN YEARS	1.5				
	APPENDIX 1.1				AS OF
GAS					
ANALYSI					
				ESTIMATE	GA
MAP NO.	DESCRIPTION	OIL USAGE	USAGE	ANN. SAVING	CONV
		IN TONS	%	IN \$	CC
27	REGION HOSPITAL "STOJIAN KIRKOVITCH	3036	39.2%	\$529,914	N
20	POLYCLINIC NO. 11	689	8.9%	\$120,260	N
17	FOREIGN LANGUAGE SCHOOL "ROMEN ROLAN"	348	4.5%	\$60,741	S
8	HOME FOR DISABLED PEOPLE	318	4.1%	\$55,505	S
15	II SECONDARY SCHOOL	317	4.1%	\$55,330	N
9	STARA ZAGORA MUNICIPALITY BUILDING	317	4.1%	\$55,330	S
1	SECONDARY SCHOOL "IVAN VAZOV"	316	4.1%	\$55,156	S
21	SPORTS HALL	232	3.0%	\$40,494	S
19	SWIMMING POOL	222	2.9%	\$38,749	S
2	9th PRIMARY SCHOOL "VESELIN HANTCHEV"	216	2.8%	\$37,701	S
26	5th PRIMARY SCHOOL	212	2.7%	\$37,003	S
10	CITY THEATRE	158	2.0%	\$27,578	S

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